No. 799,102. PATENTED SEPT. 12, 1905.

G. SPARKS.

HYDRAULIC CLUTCH.

APPLICATION FILED AUG. 17, 1904.

5 SHEETS—SHEET 1.

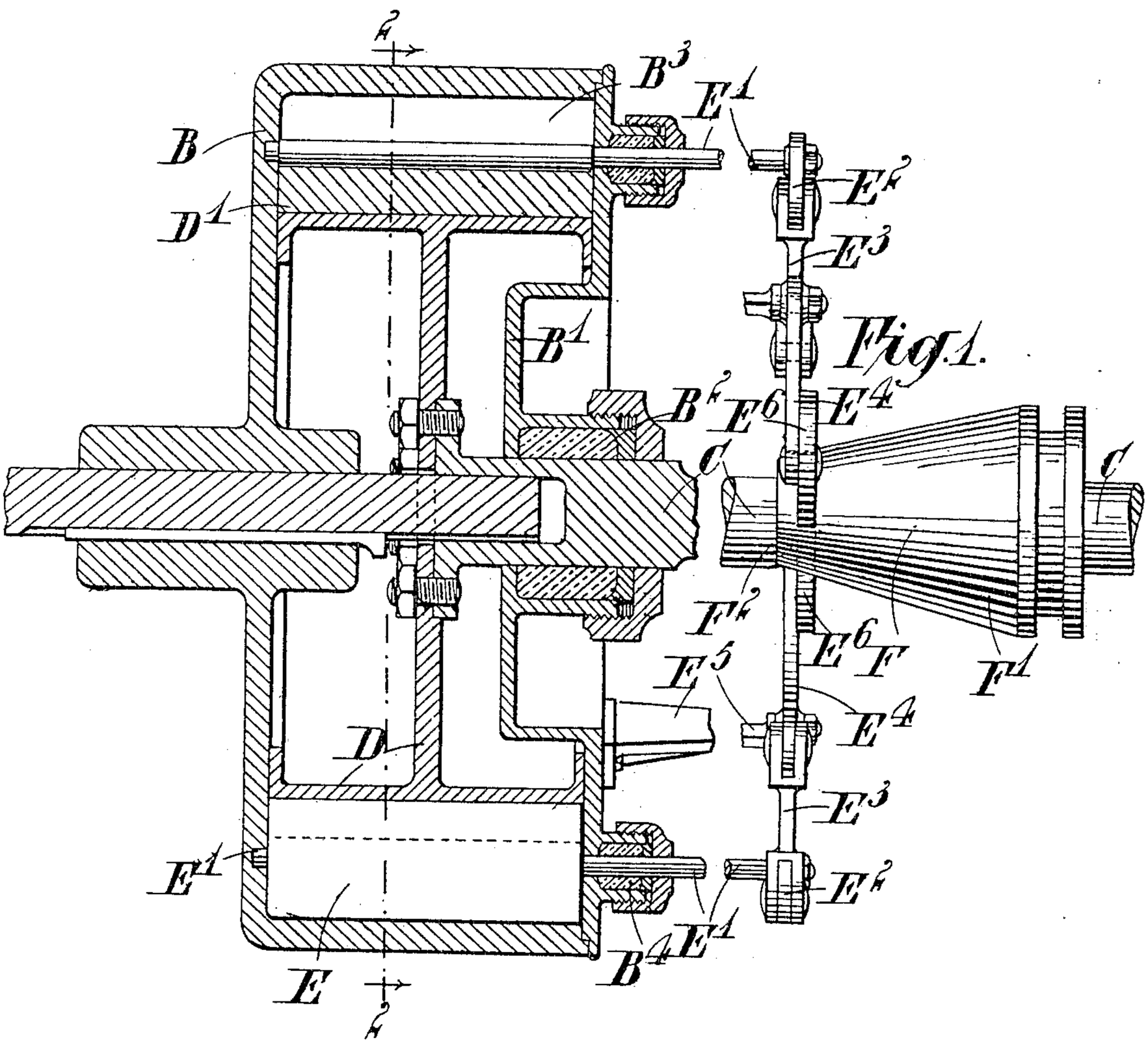


Fig. 1.

Fig. 3.

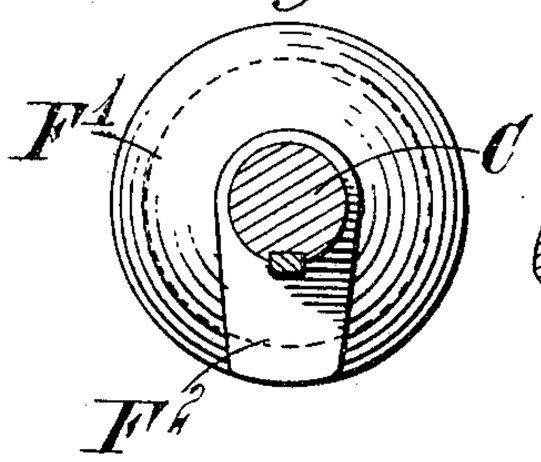
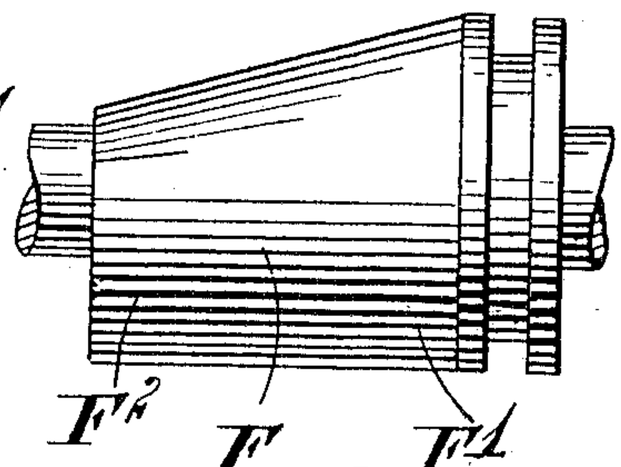


Fig. 4.



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5 SHEETS—SHEET 2.

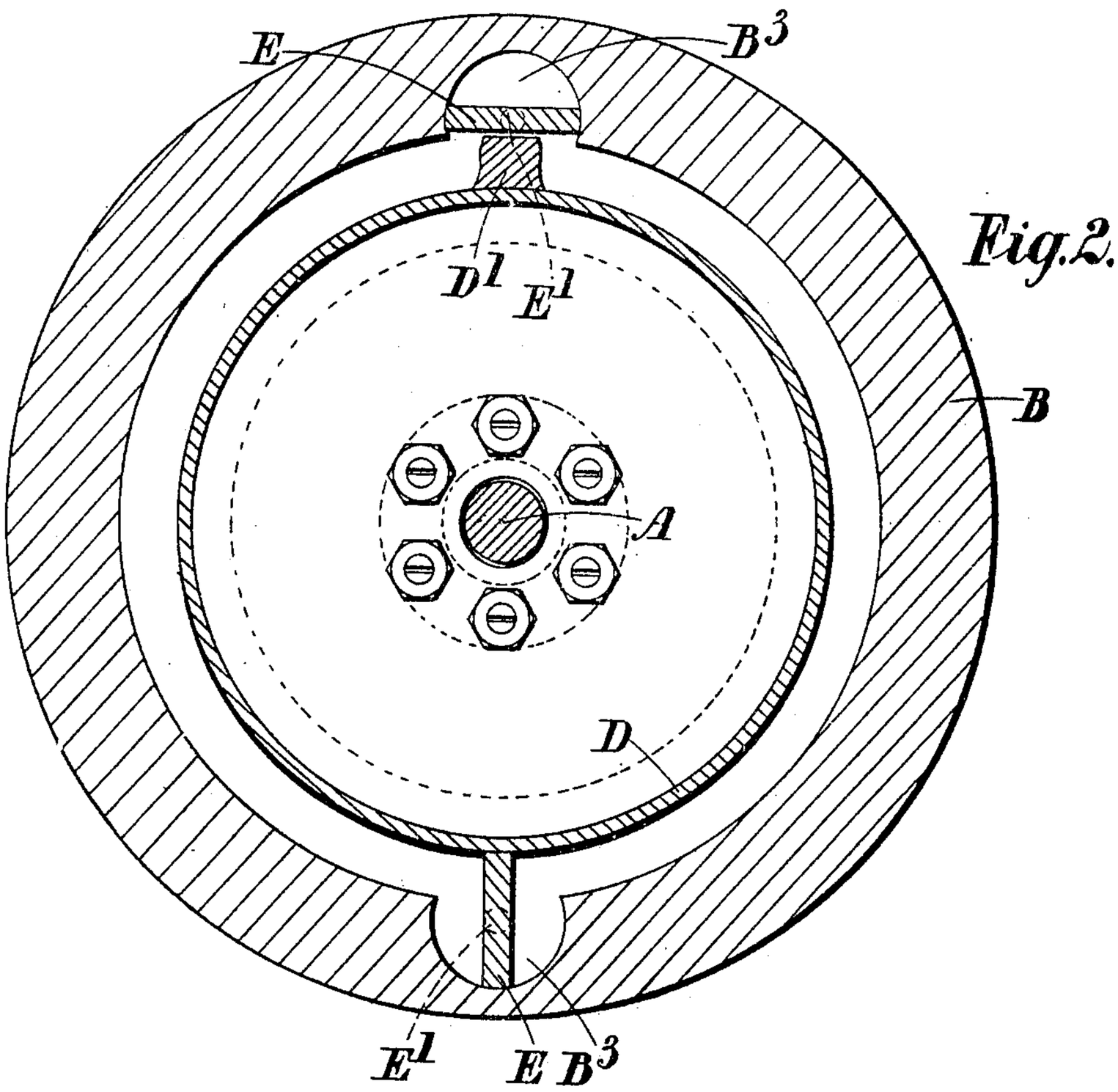

Fig. 2.

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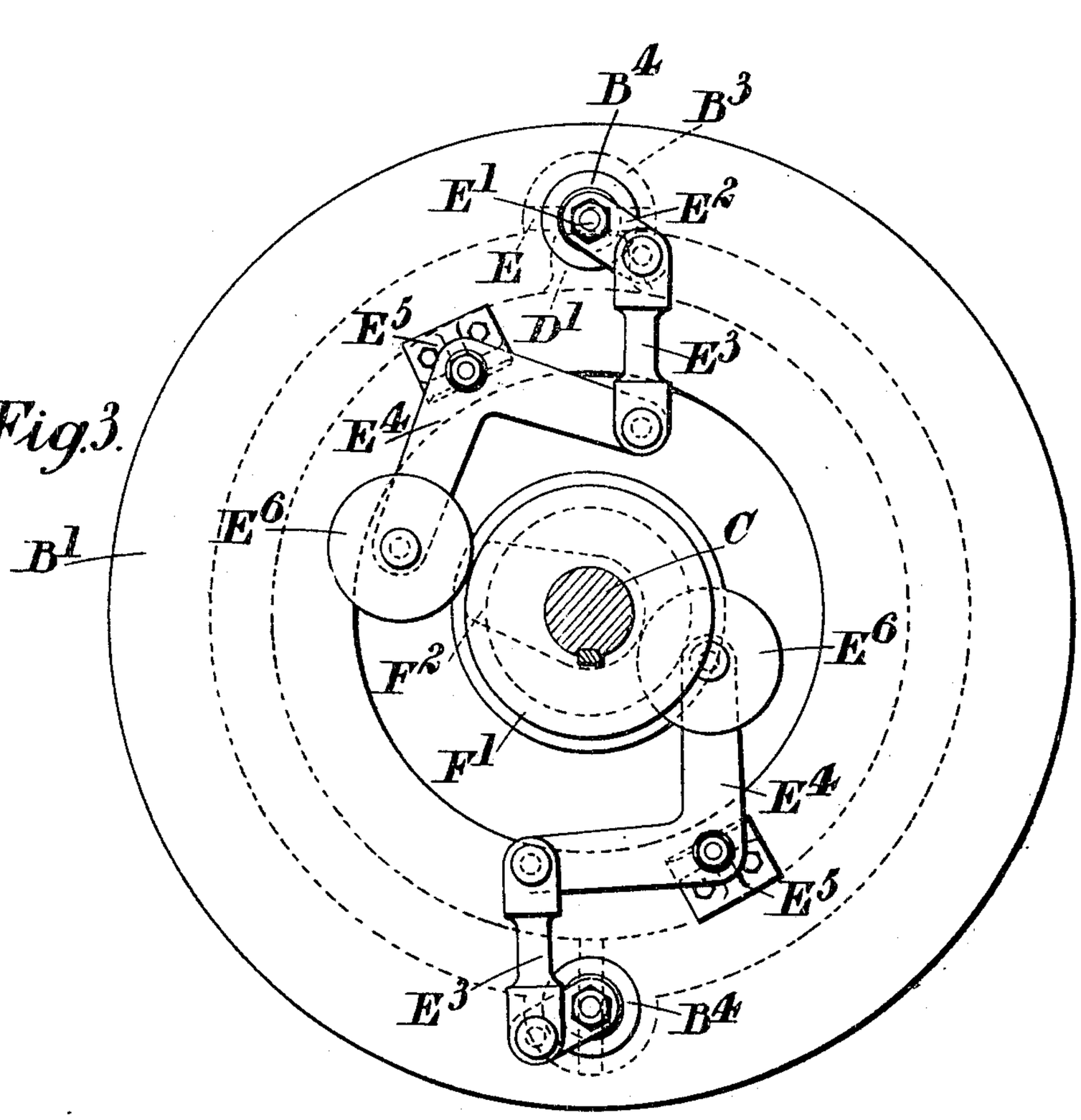
5 SHEETS—SHEET 3.

Fig. 3.



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5 SHEETS—SHEET 4.

Fig. 6.

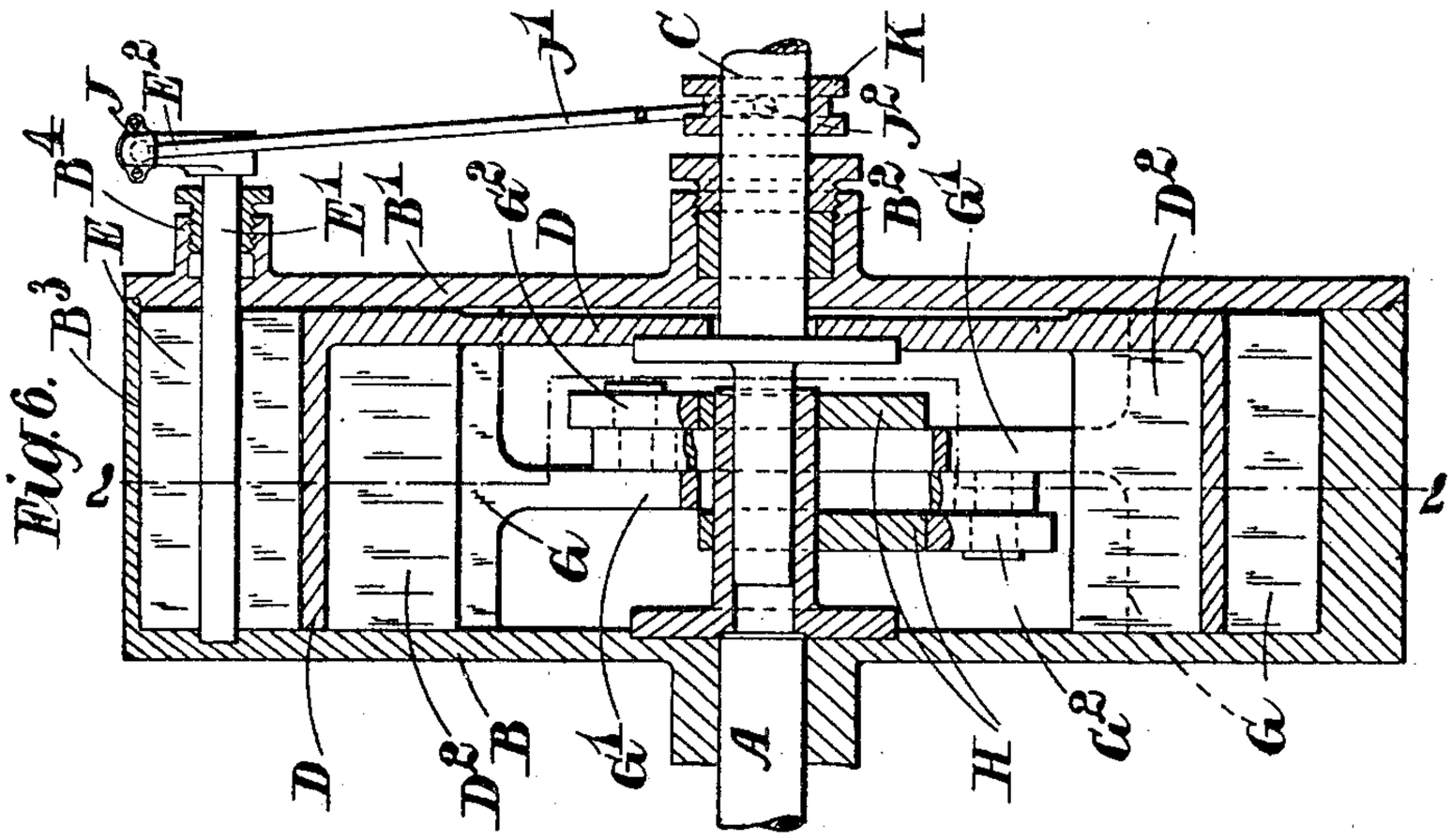
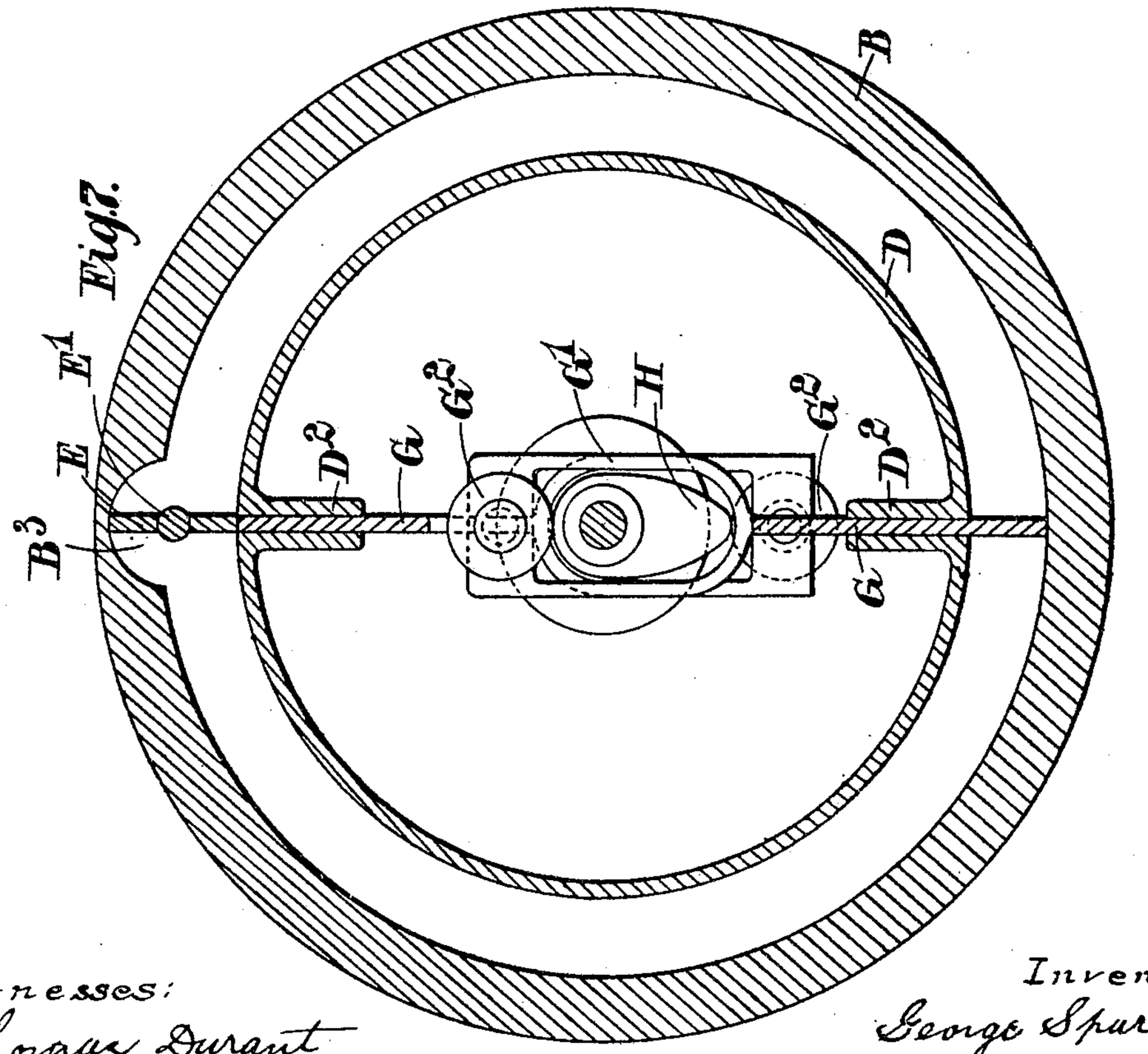


Fig. 7.



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5 SHEETS—SHEET 5.

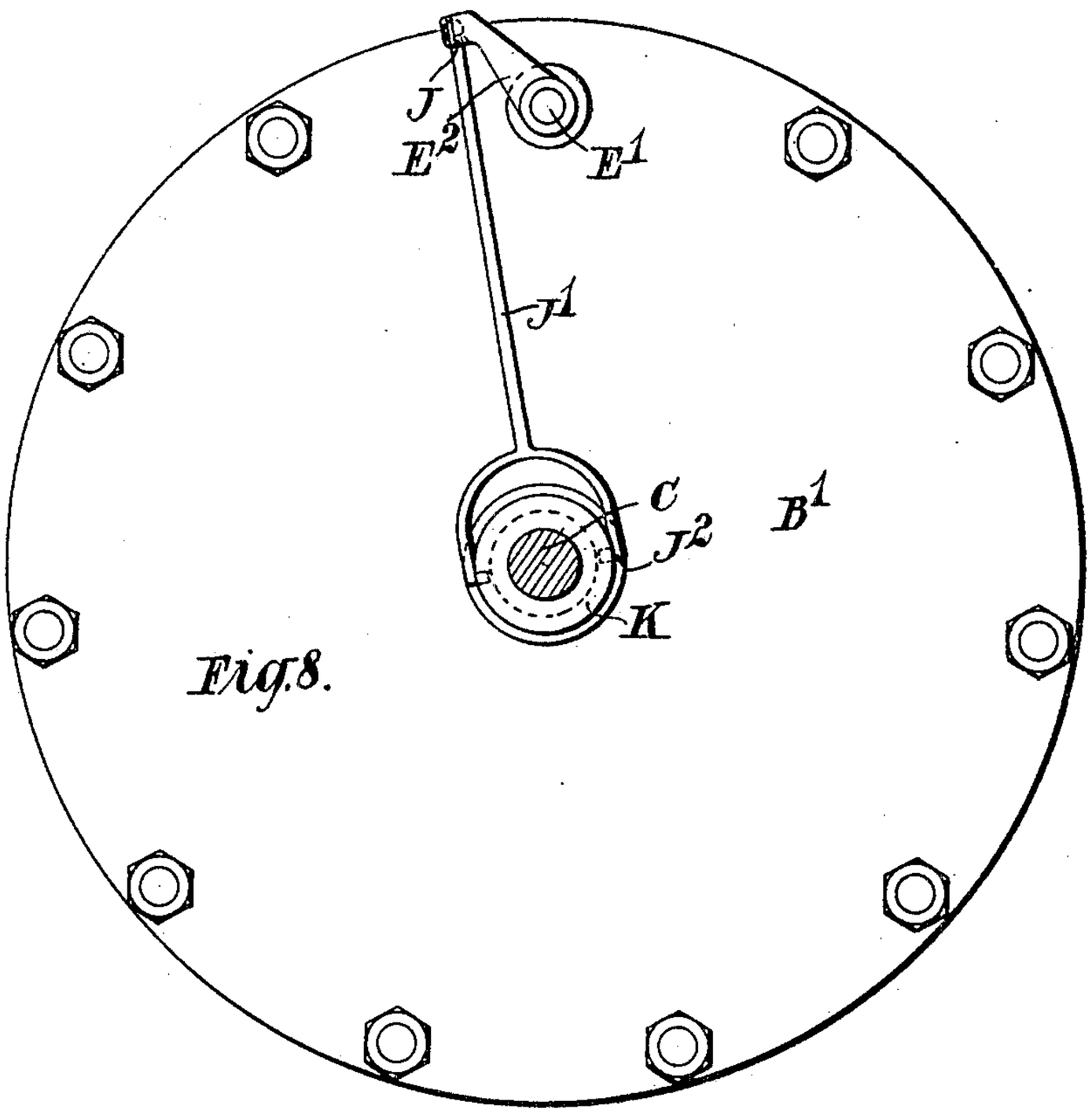

Fig. 8.

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UNITED STATES PATENT OFFICE.

GEORGE SPARKS, OF FELTHAM, ENGLAND.

HYDRAULIC CLUTCH.

No. 799,102. Specification of Letters Patent. Patented Sept. 12, 1905.

Application filed August 17, 1904. Serial No. 221,083.

To all whom it may concern:

Be it known that I, GEORGE SPARKS, a subject of the King of England, residing at Feltham, county of Middlesex, England, have invented certain new and useful Improvements in Hydraulic Clutches, of which the following is a specification.

The present invention relates to improvements in hydraulic clutches, the object being to provide a clutch in which the liquid can be locked between the driving and driven members and in which the relative motion between the driving and driven members may be allowed for at any speed without injurious effects.

According to this invention the hydraulic clutch comprises a driving member having a hollow casing thereon, the driven member projecting within the casing and forming therewith a closed annular chamber containing the liquid, such as oil. A projection on one member (say the driven member) fits into and divides the chamber, while a displaceable valve is mounted on the other member (say the driving member) and adapted to fit into and divide the chamber. Means are provided for displacing the valve momentarily to clear the projection, and means are also provided for allowing escape of liquid from the chamber to permit relative motion between the members.

In the accompanying drawings, which illustrate the application of this invention to a clutch for a motor-vehicle, Figure 1 is a longitudinal section of one form of clutch constructed in accordance with this invention. Fig. 2 is a transverse section of the same on the line 2 2 of Fig. 1. Fig. 3 is an end view of the same. Fig. 4 is a side view, and Fig. 5 an end view, of the clutch-cam. Fig. 6 is a longitudinal section of a modified form of clutch constructed in accordance with this invention. Fig. 7 is a transverse section of the same on the line 7 7 of Fig. 6. Fig. 8 is an end view of the same.

Like letters indicate like parts throughout the drawings.

Referring to Figs. 1, 2, and 3, the driving-shaft A has fixed upon it a hollow case or fly-wheel B, having a cover B′, thus forming a closed chamber. The driven or propeller shaft C, coaxial with the driving-shaft, projects into the hollow fly-wheel through a stuffing-box B^2 in the cover B′. Within the fly-wheel and mounted concentrically on the driven shaft C is a ring or disk D, which is as wide as the space between the ends of the fly-wheel or case, but smaller in diameter than the fly-wheel, so that an annular space is formed between the two, hereinafter referred to as the "chamber." A projection D′, shaped to fit into the annular chamber, is fixed on the periphery of the ring D. One or more valves E are pivotally mounted on the spindles E′ within recesses B^3 in the rim of the fly-wheel B. Conveniently two such valves are provided on opposite sides of the fly-wheel. Each valve is arranged so that it fits the annular chamber when closed, but is automatically removed or opened immediately before the projection D′ on the ring D reaches it and closed again immediately the projection D′ passes. In this particular form of my invention the spindle E′ of the valves E passes through stuffing-boxes B^4 in the cover B′ and the mechanism for actuating the valves is placed outside the case. It comprises a link E^2, fixed to the spindle E′, and a second link E^3, pivoted to the first link E^2 and also to a bell-crank lever E^4, which is pivoted on a support E^5, projecting from the fly-wheel cover B′. The bell-crank lever E^4 carries a roller E^6, which is held in contact with a cam F, mounted to slide on the driven shaft C by means of a coiled spring on the support E^5 or the like. The cam F is circular at the end F′ farthest from the fly-wheel and tapers down to a projection F^2 on one side of length equal to the greatest radius. The cam is actuated from a pedal-lever or the like in the same manner as the inner member of an ordinary clutch—that is to say, through a forked lever engaging a groove in the cam—and is so arranged that when the circular part F′ is in contact with the rollers E^6 the valves E are held open, while when the narrow projecting end F^2 is in contact with the rollers E^6 the valves E are momentarily opened as the projection D′ passes. The fly-wheel case is completely filled with a suitable medium, such as oil, which may conveniently occupy all the free space between the various members, but in particular fills the annular chamber between the fly-wheel rim B and the ring D.

The operation of the clutch is as follows: In order to allow the fly-wheel B to rotate independently of the ring D, the valves E are held wide open by means of the usual foot-pedal (or hand-lever, if desired) by sliding the taper cam F along the shaft C until the circular portion F′ is in contact with the rollers E^6. Supposing the motor to be running and the car stationary, the fly-wheel case B B′ revolves, the central ring D, with the attached

shaft C, being stationary. By now sliding the cam F along the shaft C the valves E may be closed to the desired amount, and considerable resistance is offered to the motion of the fly-wheel, as the oil is now being forced through a smaller opening, and consequently the car may be started in motion, the speed being increased by further closing the two valves until finally when quite closed the oil is locked in the chamber between the driving and the driven members. The two then revolve at a uniform speed and will continue to do so until the valves are again opened. In the closed position of the valve there may be some leakage; but the object is to produce a substantially closed or locked chamber between the valves E and the abutment D′, and it is assumed in the specification and claims that such a closure actually takes place. By holding the valves partly open or by arranging a "by-pass" which could be controlled by the foot-pedal a definite amount of slip can be set and altered at will, the slip being in direct proportion to the amount of oil which is allowed to pass between the projection D′ and the valves E. If during driving there is relative motion between the fly-wheel B and the ring D, each valve E will be turned into the recess B^3 by means of the cam projection F^2 each time the projection D′ passes.

In the construction described the roller E^6 and the arm on which it is journaled are made lighter than the links on the other side of the pivot E^5, so that the roller E^6 is constantly maintained in contact with the cam F by the centrifugal force on the links. If desired, the contact may be insured by the use of springs.

Referring to Figs. 6, 7, and 8, it will be seen that the position of the valve and stop or projection may be reversed. The valves G, actuated by the cam H, may be attached to the inner ring D, the cam being within the case, and the stop or projection in the form of a butterfly-valve E may be attached to the outer case and in this form is made removable to be acted upon by the pedal or levers, as before described. In the form shown the general arrangement of driving and driven members is as before. The ring D is provided with one or more valves G, each of which slides in a recess D^2 in the disk, and conveniently two such valves are provided on opposite sides of the ring. Each valve is arranged so that it fits the annular chamber when closed, (in its extreme outward position,) but is automatically opened or removed immediately before the valve E reaches it and closed again immediately the valve E passes. In the form illustrated each valve G terminates in a frame G′, carrying a roller G^2, which rests in contact with a cam H, fixed on the driving-shaft A. The projection on each cam H is set diametrically opposite the valve E, so that as the ring D rotates the valve G is automatically pulled into the recess D^2 and pushed out again as the valve E passes. In order to allow free relative motion between the driving and driven members, the valve E may be turned more or less into the recess B^3 in the fly-wheel either by a cam mechanism, as before, or by the mechanism illustrated. Here the spindle E′ carries a link E^2, pivoted, by means of a ball-joint J, to a link J′, having a fork J^2 engaging a grooved sleeve K, which slides on the driven shaft C and is operated by a foot-pedal in the same manner as the inner member of an ordinary clutch. When the sleeve K moves toward the fly-wheel, the link E^2 is pushed up and closes the valve E, and when the sleeve K moves in the opposite direction the link E^2 is pulled down and opens the valve E.

In either of the arrangements shown an adjustable by-pass may be used, and it is to be understood that the form of the chambers and the arrangement of the valves or projections may be varied without departing from this invention. For example, the valves and projection may be interchanged.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In a hydraulic clutch the combination of a driving member, a hollow casing thereon, a driven member projecting within the casing and forming therewith a closed annular chamber, a liquid in the chamber, a projection on one member fitting into and dividing the chamber, a displaceable valve mounted on the other member and adapted to fit into and divide the chamber, means for displacing the valve momentarily to clear the projection, and means for allowing escape of liquid from the chamber to permit relative motion between the members.

2. In a hydraulic clutch the combination of a driving member, a hollow casing thereon, a driven member projecting within the casing and forming therewith a closed annular chamber, a liquid in the chamber, a projection on the driven member fitting into and dividing the chamber, a displaceable valve mounted on the driving member and adapted to fit into and divide the chamber, and means for displacing the valve wholly or partly to allow relative motion of the members or momentarily to clear the projection.

3. In a hydraulic clutch the combination of a driving-shaft, a dished fly-wheel thereon, a cover on the fly-wheel, a driven shaft projecting through the cover into the fly-wheel, a disk on the driven shaft of smaller diameter than the fly-wheel and forming therewith an annular chamber, oil in the chamber, a projection on the disk fitting into and dividing the chamber, two valves rotatably mounted in recesses on opposite sides of the fly-wheel adapted to fit into and divide the chamber and to turn into the recesses, means for turning each valve into its recess momentarily to

clear the projection and independently to allow relative motion of the shafts.

4. In a hydraulic clutch the combintaion of a driving-shaft, a dished fly-wheel thereon, a a cover on the fly-wheel, a driven shaft projecting through the cover into the fly-wheel, a disk on the driven shaft of smaller diameter than the fly-wheel and forming therewith an annular chamber, oil in the chamber, a projection on the disk fitting into and dividing the chamber, two valves rotatably mounted in recesses on opposite sides of the fly-wheel adapted to fit into and divide the chamber and to turn into the recesses, a sliding cam on the driven shaft, and operative connection between the cam and the valves, a circular portion on the cam adapted to retain the valves in the recesses and a projecting portion on the cam adapted to turn each valve momentarily to clear the projection.

5. In a hydraulic clutch the combination of a driving-shaft, a dished fly-wheel thereon; a cover on the fly-wheel, a driven shaft projecting through the cover into the fly-wheel, a disk on the driven shaft of smaller diameter than the fly-wheel and forming therewith an annular chamber, oil in the chamber, a projection on the disk fitting into and dividing the chamber, two spindles rotatably mounted in recesses on opposite sides of the fly-wheel, valves on the spindles adapted to fit into and divide the chamber and to turn into the recesses, link mechanism connected to each spindle, a tappet-roller thereon, and a sliding cam on the driven shaft in contact with the roller having a circular portion adapted to retain the valves in the recesses and a projecting portion adapted to turn each valve momentarily to clear the projection.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

GEORGE SPARKS.

Witnesses:

ALFRED J. BOULT,

HARRY B. BRIDGE.